matter of fact, this constant when derived from the observed zenith distances of known stars is 40″, but this amount, of course, refers only to the difference of flexure at the eye and object-glass ends. Direct measurements have, however, been made of the deflection of either end. For this purpose a small telescope was attached to the cradle of the instrument, with which a scale placed at either end could be read, the instrument being in both a vertical and horizontal position. The result was that the object-glass dropped 5·48 mm., and the eye end 3·22 mm.; when all necessary corrections have been made, this gives a flexure of 34″, a satisfactory agreement with that obtained from observations of stars. This deflection from the straight line was observed at eight different angles with reference to the horizon, and the results are fairly represented by supposing the flexure to vary simply as the sine of the zenith distance.

As regards the light-collecting capacity, it may be mentioned that the satellite of Neptune can be observed in an illuminated field without difficulty, and that the satellites of Mars were observed on fifteen evenings in 1886, a year in which the opposition fell very unfavourably for their observation. Hyperion is visible on a feebly illuminated red field, while Enceladus and Mimas are visible till quite close to the planet's disk. That there are difficulties in the employment of such large telescopes goes without saying: it is, however, satisfactory to notice that the number of evenings on which the telescope cannot be used from bad definition or adverse meteorological conditions is not larger than in the case of the 15-inch equatorial.

W. E. P.

SIR WARINGTON W. SMYTH, F.R.S.

MINING has suffered an irreparable loss by the death of Sir Warington Smyth, which occurred suddenly at his house in Inverness Terrace on the 19th inst. He was the eldest son of Admiral W. H. Smyth, F.R.S., and was born at Naples 73 years ago. He was educated at Westminster and Bedford Schools and at Trinity College, Cambridge, where he exhibited great skill as an oarsman, being one of the winning University crew on the Thames in 1839. In that year he graduated, and obtained a travelling fellowship which enabled him to devote more than four years to a journey through the chief mining districts of Europe, and thus to lay the foundation of that practical knowledge which subsequently made him the greatest British authority on mining matters. Continental travelling in 1839 was by no means the easy matter it is now, and his journey through the Harz, Saxony, Austria, Hungary, Turkey, and Asia Minor, was not devoid of risk and adventure. As a result of his travels through the European and Asiatic dominions of the Sultan, he published in 1854 a work entitled "A Year with the Turks." In subsequent years, he visited during his vacations the more important mines of France, Belgium, Spain, Italy, and Norway. His official career began in 1844, when he was appointed by Sir Henry De la Beche to a post on the Geological Survey, and while holding this position he explored and geologically mapped the metalliferous districts of Devon and Cornwall, North Wales, and Ireland, and the coal-fields of Lancashire and Yorkshire, North Staffordshire and Derbyshire. In 1845 he joined the Geological Society, and in 1866 was elected President of that body. For the last 17 years he has acted as foreign secretary, in which post his rare linguistic powers proved of great service to the Society. On the foundation of the Royal School of Mines in 1851, he was appointed the first lecturer on mining and mineralogy. On the reorganization of the School in 1881, he gave up the Chair of Mineralogy, but acted as Professor of Mining until his death. He held the office of inspector of the mines in the Duchy of Cornwall, and in 1857 he was also appointed comptroller of all the mineral properties belonging to the Crown. It would be tedious to enumerate the long list of Royal Commissions and International Exhibitions with which Sir Warington was prominently associated. His report as Secretary of the Jury on the mining industry at the Exhibition of 1862 is a model of what such a work should be, and to his energy on the Council of the Inventions Exhibition of 1885 the success of the mining section was largely due.

In 1879 a Royal Commission was appointed to inquire into accidents in mines and the possible means of preventing their occurrence and of limiting their disastrous consequences. Mr. Smyth was appointed Chairman, and, in order to secure time to attend to the duties of this arduous and honorary office, he resigned the post of Examiner to the Science and Art Department—an office he had held for several years. The Commission ended its work in 1886, and during the seven years it was in existence some thousands of experiments were made, and the Report, covering 858 pages, definitely settled many important questions bearing upon the diminution of accidents in mines.

To his scientific attainments, Sir Warington added singular literary skill. His early classical training enabled him to write with an elegance and vigour unfortunately rare in technical works. He spared no pains, and neglected no details. As a teacher he was very popular with his pupils, his success as a lecturer being due not only to his finished delivery, but also to his skill as a draughtsman, which enabled him to dispense with the aid of elaborate diagrams, and to rely merely on accurate blackboard sketches, which he drew with great rapidity in the presence of his class. His reputation as Professor attracted to the School of Mines students from all parts of the world, and no better evidence of the excellence of his teaching could be adduced than that afforded by the important positions so many of his pupils occupy in the mining world. Of his literary works, the most important is his "Rudimentary Treatise on Coal-Mining"—a standard work, bearing internal evidence of not being mere extracts of books, written in 1867, and now in its seventh edition. Besides this, he wrote the articles on mining for "Ure's Dictionary" and for Stanford's series of "British Manufacturing Industries," 1876.

For his labours on the Accidents in Mines Commission, and for his other public services, he received the somewhat tardy acknowledgment of knighthood on the occasion of Her Majesty's Jubilee. Throughout his life he refused the great pecuniary rewards offered by the commercial branches of mining, and preferred to devote the half-century during which he was engaged in business connected with mines to the service of science and of the State. Although he had been in ill-health for some time, he never neglected his official duties. He died in harness, with a partially corrected examination paper on the table before him. He was buried yesterday at St. Erth, in Cornwall, not far from his home at Marazion, in the centre of the mining district with which he was so long associated.

B. H. B.

NOTES.

WITH the consent of the Prince of Wales, the President, the Council of the Society of Arts has awarded the Albert Medal to Dr. W. H. Perkin, F.R.S., "for his discovery of the method of obtaining colouring matter from coal tar, a discovery which led to the establishment of a new and important industry, and to the utilization of large quantities of a previously worthless material."

THE Essex Field Club and the subscribers to the Gilbert Club will hold a meeting at Colchester on Saturday, July 5, in memory of William Gilbert, the founder of the science of electricity, who was born and died at Colchester. A visit will be made to Gilbert's house and tomb, and Prof. Silvanus P. Thompson will lecture on "The Early Magnetic Experiments of Gilbert of Colchester." The chair at the public luncheon will be taken by Lord Rayleigh, F.R.S., Vice-President of the Essex Field Club and the Gilbert Club. Any persons wishing to attend the meeting may obtain full particulars on application to Mr. W. Cole, Hon. Sec., Buckhurst Hill, Essex.

THERE is no foundation for the report that Dr. G. J. Romanes is a candidate for the Linacre Professorship of Human and Comparative Anatomy, Oxford.

THE Photographic Convention of the United Kingdom is now holding its annual meetings at Chester. The series of meetings was opened on Monday, and will not be concluded until Saturday. At the official welcome of the Convention by the mayor, on Monday, Mr. A. Pringle, the retiring President, introduced his successor, Mr. C. H. Bothamley. In the course of his address, the new President said that the events of last year contained nothing of first-rate importance in photography; no discoveries of far-reaching influence had disturbed the photographic world. But a good deal of interest had been excited by the announcement that advances had been made towards the solution of the problem of photographing objects in their natural colours. Coloured photographs, more or less imperfect, had been made several times, but whether they should ever get a chromatic negative process was at present entirely a matter of conjecture, and so far even the direction in which the solution was to be looked for was not apparent. Photo-mechanical printing had not presented any new feature during the past year, but the processes already in operation had been taken much greater advantage of. The applications of photography to science were becoming every day more and more numerous, and he did not hesitate to say that it was here that photography had won, and probably would win in the future, its greatest triumph.

THE Elizabeth Thompson Science Fund, which has been established by Mrs. Elizabeth Thompson, of Stamford, Conn., "for the advancement and prosecution of scientific research in its broadest sense," now amounts to 26,000 dollars. As accumulated income will be available in December next, the trustees desire to receive applications for appropriations in aid of scientific work. This endowment is not for the benefit of any one department of science, but *Science* says it is the intention of the trustees to give the preference to those investigations which cannot otherwise be provided for, which have for their object the advancement of human knowledge or the benefit of mankind in general, rather than to researches directed to the solution of questions of merely local importance. Applications for assistance from the fund, in order to receive consideration, must be accompanied by full information, especially in regard to the following points: (1) precise amount required; (2) exact nature of the investigation proposed; (3) conditions under which the research is to be prosecuted; (4) manner in which the appropriation asked for is to be expended. All applications should reach, before December 1890, the Secretary of the Board of Trustees, Dr. C. S. Minot, Harvard Medical School, Boston, Mass., U.S.A. It is intended that new grants shall be made at the end of 1890. The trustees are disinclined for the present to make any grant exceeding 300 dollars: decided preference will be given to applications for smaller amounts.

THE U.S. National Academy of Sciences is considering whether it might not be expedient to divide its membership into classes. The following classification has been proposed: mathematics, physics, astronomy, geodesy and mechanics, chemistry, geology, botany, zoology, anthropology, and political economy and statistics. The *American Naturalist*, commenting on this list, suggests that a special place should be reserved for psychology. It also expresses a hope that the division into classes will not be made a pretext for increasing the membership to above one hundred persons.

LAST week Mr. Mundella asked the Vice-President of the Council of Education whether he had received remonstrances from the principal educational authorities and managers of higher elementary schools in England and Scotland against Article 40 of the Science and Art Department, which excluded scholars in public elementary schools from being henceforward examined or earning grants in science; whether he had seen the statement of the National Association for the Promotion of Technical Education, which described this circular "as one of the most serious blows which had been struck for some years at the development of scientific and technical education"; and whether, having regard to the feeling with which the circular had been received, he would cause it to be withdrawn. Sir W Hart Dyke replied that the matter was under consideration; and he has since issued an official letter, stating that the Department had anticipated the objection which had been made, and had decided to substitute a provision which would not in any way interfere with the present system of science instruction so admirably carried out by many School Boards. With reference to a complaint that in another circular dealing with the question of manual instruction in public elementary schools, a proviso had been inserted requiring such instruction to be given out of school hours, Sir W. Hart Dyke states that a supplementary circular will be shortly issued in order to remove the doubts which exist on the subject. Sir William believes there will be no difficulty in continuing the plan now adopted, providing the time devoted to manual instruction by any scholar for the purposes of the grant is outside the minimum period required to constitute an attendance under Article 12 of the Code, which does not prevent any further time from being given to the subject within the ordinary school hours.

THE *Kew Bulletin* publishes every year a complete list of the garden plants annually described in botanical and horticultural publications, both English and foreign. In Appendix II., which has just been issued, there is a list of all the introductions recorded during 1889. It is pointed out that these lists are indispensable to the maintenance of a correct nomenclature, especially in the smaller botanical establishments in correspondence with Kew, which are, as a rule, only scantily provided with horticultural periodicals. Such a list will also afford information respecting new plants under cultivation at the Kew establishment, many of which will be distributed from it in the regular course of exchange with other botanic gardens.

THE *Botanical Gazette* informs us that the first Annual Report of the Director of the Missouri Botanic Garden has been issued. It contains a statement of the changes that are being made in the Gardens, or that are in immediate prospect; and a map of the grounds on a large scale is being prepared. The Director requests from authors copies of their publications for the library, from collectors specimens for the herbarium, and promises all feasible assistance in work calculated to promote botanical knowledge.

THE first number is published of a new quarterly journal, *Le Diatomiste*, specially devoted to the natural history and literature of diatoms. It is published at 168 Rue Saint-Antoine, Paris, under the editorship of M. J. Tempère, assisted by MM. Brun, Bergon, Cleve, Dutertre, Grove, and Peragallo. The present number (quarto, with two plates) contains descriptions of a number of new species, and a bibliography of recent diatomological literature.

In the *Journal of the Straits Branch of the Royal Asiatic Society*, Mr. Alfred Everett has just published a most important list of the birds of the Bornean group of islands. Hitherto the work of Salvadori has been the standard record for Bornean ornithology, but the numerous discoveries of recent years have rendered that author's "Uccelli di Borneo" considerably out of date, and the Catalogue of Bornean birds published by Dr. Vorderman in 1886 is a list of names merely. The work just completed by Mr. Everett will therefore be of great assistance to ornithologists, as it gives references to all the recent scientific memoirs on Borneo, published in England and in Germany. 570 species have now been recorded from the islands, the numbers having been considerably increased by the recent discoveries of the author himself and Mr. John Whitehead's expedition to Kina Balu. Mr. Everett has given a carefully compiled list of the localities where the species have been found by himself and other travellers. Two very good maps of Borneo are given, one "showing roughly the distribution of highlands and lowlands," with all the best-known collecting stations indicated as well; and the other being a map of Palawan, showing by the soundings that this island is intrinsically a part of Borneo rather than of the Philippine archipelago.

In the current number of the *Board of Trade Journal*, it is stated that the French Consul-General at Warsaw has informed his Government of the establishment of a commercial museum in Warsaw. This is to form a permanent exhibition of specimens of the products and manufactures of Poland, as well as a bureau of information for Russian or foreign merchants. At a small charge all persons can be supplied at the office of this museum with information on any subject connected with trade. The museum is at present at No. 66 Faubourg de Cracovie, Warsaw.

A Meteorological Society is to be established in New York, where many persons are giving attention to weather science, owing to the relations existing between some branch thereof and their own vocation. It is intended that the Society shall be purely local at first.

Das Wetter for May contains an article by Dr. P. Perlewitz upon the influence of the town of Berlin upon its climate. He finds that the difference of the mean temperature between the town and the open country outside differs, in various months, from 0°·7 to 2°·3, the town being always warmer. The smallest differences are in spring and winter. The greatest daily differences are found to be in the evening, owing to a retardation of radiation in the town; from this time the difference decreases until about midday, when there is no perceptible difference between the two localities. Dr. Hann has found similar results for Vienna, but the differences there are smaller, owing to the better exposure of the town station. The humidity is less in the town than in the country; in the evening, in June and July, the difference amounts to above 19 per cent. No appreciable effect appears to be exerted by the town upon the rainfall, as compared with that of the country stations.

Dr. G. Hellmann, to whom meteorologists are indebted for various interesting investigations into the history of that science, has contributed to *Himmel und Erde* (Heft. 3 and 4, 1890) two instructive articles on "the beginnings of meteorological observations and instruments." He divides the history of the development of observations into three periods: (1) that ending with the middle of the fifteenth century, up to which time they were of a very fragmentary and almost aimless character; (2) that in which observations were taken, at least once a day; and (3) that in which they were systematically taken with instruments, dating from about the middle of the seventeenth century. It is not exactly known who first kept a regular meteorological journal, but Humboldt attributes it to Columbus, on his first voyage to America in 1492, while the Italians also appear to have made daily observations from the middle of the fifteenth century. The wind-vane is by far the oldest of the meteorological instruments. In the periods of Homer and Hesiod, in the ninth and eighth centuries B.C., the qualities of the winds were correctly described. The first arrangement for observing the wind-direction is the Temple of Winds at Athens, which was built about 100 years B.C. A picture of this tower is given by Dr. Hellmann. Eginhard, in the reign of Charlemagne, denoted the winds by the four cardinal points, and their variations. The first instrument for denoting the *force* of the wind is ascribed to Robert Hooke (1667); this instrument is essentially the same as that now used and known as Wild's pendulum anemometer. The absorption or organic hygrometer was invented about the middle of the fifteenth century, by N. de Cusa, although the invention is generally ascribed to L. da Vinci. The first condensation hygrometer is attributed to the Grand Duke Ferdinand II. of Tuscany. The first continuous hygrometrical observations appear to have been by R. Boyle, at Oxford, in June 1666. The first thermometer is attributed to G. Galilei, towards the end of the sixteenth century. Some few years later, the instrument was improved, although the freezing-point was the only fixed point determined, and the graduation was made by means of little knobs in the glass, every tenth one being enamelled. The first rain-gauge was used by B. Castelli in 1639, although usually a later date is quoted. The discovery of the Torricellian tube, in 1643, is too well known to require special remark. These are only a few of the very interesting points referred to in Dr. Hellmann's instructive investigations.

In an interesting paper contributed to the May number of the Ottawa *Naturalist*, and now reprinted separately, Dr. G. M. Dawson brings together some striking facts with regard to the extent of Canadian territory which is still unexplored. The entire area of the Dominion is computed at 3,470,257 square miles, and he calculates that an area of 954,000 square miles of the continent alone, exclusive of the inhospitable detached Arctic portions, is for all practical purposes entirely unknown. In this estimate the area of the unexplored country is reduced to a minimum by the mode of definition employed, and Dr. Dawson thinks we may safely assume that it is about one million square miles, or between one-third and one-fourth of the whole. That the aggregate of unknown territory is so vast is not quite creditable to Canadian energy; but Dr. Dawson hopes that the task of exploration will be undertaken by no one who has not the necessary scientific qualifications. "The explorer or surveyor," he says, "must possess some knowledge of geology and botany, as well as such scientific training as may enable him to make intelligent and accurate observations of any natural features or phenomena with which he may come in contact."

There is a disease in Japan known as *kakké*, a disorder of the kidneys communicated by bacilli, and closely related to the more virulent *beri-beri*. From the distribution of *kakké*, M. Gueit has recently drawn conclusions as to the ethnic composition of the present population of Japan. The fact that Chinese always escape the disease, even in localities where it is very prevalent, indicates (in his opinion) that the Chinese or Mongolian element is not the dominant one. He finds three constituents in the population: (1) descendants of Ainos; (2) of Negritos; and (3) a Malayan element, which is the most prominent. Wherever the Malayan goes, he brings with him the *beri-beri* order of disease his liability to this being probably due to the Hindu blood in him. From India we find *beri-beri* spread, like the Malays, to Madagascar on the one side, and to Japan on the other; we meet with it also in Java, Sumatra, &c. According to the proportion of Malay blood in the natives of Japan is the frequency of the malady, which occurs in various forms and under different names. As to the Negrito element in Japan, M. Gueit found an interesting proof of it in the island of Sikok, in the form of a small statuette of Buddha, having the characteristic nose and hair of the Negritos.

IT is a well-known fact in biology that bacteria and bacilli absorb anilin and are killed by it. Two German observers—Stilling and Wortmann—have recently considered the possibility of utilizing this property in medical treatment (*Humboldt*). The diffusibility and harmlessness of violet anilin dyes (called, for brevity, "methyl-violet") without arsenic, in small doses, were first demonstrated on rabbits and guinea-pigs. Then certain eye-disorders were produced in those animals, and treated with anilin solution, the results being excellent. The authors proceeded to operate on the human subject. A skin-ulcer on a scrofulous child, which had been treated for a month with the ordinary antiseptic agents without success, was gradually healed by daily dropping a little anilin solution on the sore; and similar good results were had with bad cases of eye-disease. It soon appeared that many surgical cases were open to successful treatment in this way; and that, in general, wounds and sores developing suppuration could be sterilized with anilin. It is also thought that cases of internal inflammation, as in pleuritis and peritonitis, may prove to be not beyond the reach of this order of treatment.

MESSRS. FRIEDLÄNDER AND SON, Berlin, have issued an important monograph, by Dr. Max Blanckenhorn, on the development of the Cretaceous system in Central and Northern Syria. The author devotes especial attention to palæontological phenomena.

A MONOGRAPH, by Dr. L. Tausch von Gloeckelsthurn, on the fauna of the "gray chalk" of the Southern Alps, has been issued by A. Hölder, Vienna. The work is illustrated with nine lithographic plates.

IN the Statistical Report of the Colony of Victoria, just issued, the following are given as the latitudes and longitudes of the capitals of the Australian colonies, corrected by Mr. Ellery, the Government Astronomer of Victoria:—

Colony.	Capital City.	Latitude S.	Longitude E.
		° ′ ″	° ′ ″
Victoria	Melbourne ...	37 49 53	144 58 32
New South Wales ...	Sydney ...	33 51 41	151 12 23
Queensland	Brisbane ...	27 28 0	153 1 36
South Australia ...	Adelaide ...	34 55 34	138 35 4
Western Australia ...	Perth	31 57 24	115 52 42
Tasmania	Hobart ...	42 53 25	147 19 57
New Zealand	Wellington ...	41 16 25	174 46 38

WE are glad to learn that after eight years' cessation, Mr. John Fryer, of Shanghai, has revived his Chinese periodical, the title of which is best translated *Science Quarterly*. The first number of the re-issue contains 128 pages of reading matter of great variety. From a review in the *North China Herald*, by Dr. Martin, of Pekin, we gather that the science articles open with a chapter on appliances for illustrating the principles of mechanics. This paper forms a connecting link with the last number of the series, taking up the subject where it was dropped, and promising to carry it on to completion. The second paper begins a treatise on the principles of mechanical drawing, a subject in which the Chinese are beginning to take much interest. This is followed by the great topic of the day—railways. The steps necessary for the initiation and conduct of a railway enterprise are pointed out, the question of gauge is discussed, and statistics of cost are supplied. Then comes an elaborate paper on the state of the silk trade in China, pointing out the way to improvement, and stimulating the Chinese by the example of Japan and Italy. There is a paper on the sanitary conditions to be observed in the construction of dwellings, and one on medicinal plants, one on several strange vegetable productions, and one on entomology. Besides these, there are short papers on Edison's phonograph, the Eiffel tower, and on observatories and telescopes. The dessert which closes the feast is a profound disquisition by Dr. Edkins on the evolution of the Chinese language. It will no doubt surprise the natives to find that a foreigner has something to teach them in respect to their own language, both written and spoken. At the end are mathematical problems, in the estimation of native scholars the first essential of a scientific magazine. Nearly all the papers are profusely illustrated.

THE additions to the Zoological Society's Gardens during the past week include two Lions (*Felis leo*, juv. ♂ ♀) from Kattywar, India, presented by H.R.H. the Duke of Clarence and Avondale; a Grey Ichneumon (*Herpestes griseus* ♂) from India, presented by Mrs. H. F. Pollock; a Common Badger (*Meles taxus*), British, presented by Mr. W. H. B. Pain; a —— Galago (*Galago* sp. inc.) from South Africa, presented by Mr. Walter Carlile; a Spur-winged Goose (*Plectropterus gambensis*) from West Africa, presented by Mrs. Quayle Jones; two Common Rheas (*Rhea americana*) from South America, presented Mr. A. W. Neeld; three Grey Sparrows (*Passer simplex*) from West Africa, a Tintillon Chaffinch (*Fringilla tintillon*), two Yellow-throated Rock Sparrows (*Petronia petronella*) from Teneriffe, a Rosy Bullfinch (*Erythrospiza githaginea*) from the Canary Islands, presented by Mr. Edmund G. Meade-Waldo; a Roseate Cockatoo (*Cacatua roseicapilla*) from Australia, presented by Mr. F. C. S. Roper, F.Z.S.; a Leadbeater's Cockatoo (*Cacatua leadbeateri*) from Australia, presented by Mrs. Obbard; two Common Barn Owls (*Strix flammea*), British, presented respectively by Mr. Charles Faulkner and Mrs. Frederick Tibbs; an American Box Tortoise (*Terrapene carinata*), a Horned Lizard (*Phrynosoma cornutum*) from Mexico, presented by Mr. John Pettit; an Alligator (*Alligator mississippiensis*) from the Mississippi, presented by Mr. C. S. Morris; four Houbara Bustards (*Houbara undulata* 2 ♂ 2 ♀) from the Canary Islands, a Bonnet Monkey (*Macacus sinicus* ♂) from India, deposited; six Speigel Carp (*Cyprinus carpio*, var.), European Fresh Waters, purchased; two Bennett's Wallabys (*Halmaturus bennetti* ♀ ♀), a Derbian Wallaby (*Halmaturus derbianus* ♀), two Four-horned Antelopes (*Tetraceros quadricornis* ♀ ♀), a Burrhel Wild Sheep (*Ovis burrhel* ♀), a Thar (*Capra jemlaica*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

OBJECTS FOR THE SPECTROSCOPE.

Sidereal Time at Greenwich at 10 p.m. on June 26 = 16h. 19m. 54^{s}.

Name.	Mag.	Colour.	R.A. 1890.	Decl. 1890.
			h. m. s.	° ′
(1) G.C. 4230	—	—	16 37 45	+36 41
(1) β Lyræ	Var.	—	18 46 0	+33 14
(3) α Scorpii	1	Redddish-yellow.	16 22 40	+26 14
(4) β Herculis	2	Yellow.	16 25 30	+21 44
(5) δ Herculis	3	Bluish-white.	17 10 30	+24 58
(6) S Leonis	Var.	Yellowish.	11 5 9	+ 6 3·5

Remarks.

(1) This is the bright cluster of stars in Hercules which is probably well known to every possessor of a telescope. Seeing that it certainly consists of separate and distinct stars, no nebulosity being shown in Mr. Roberts's photograph of it, Dr. Huggins's observation of its spectrum in 1866 is very remarkable. He says:—"Spectrum of the central blaze continuous.